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09/886,083	06/21/2001	Yuichi Takamine	36856.513	5890

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EXAMINER

SUMMONS, BARBARA

ART UNIT	PAPER NUMBER
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2817

DATE MAILED: 10/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/886,083

Applicant(s)

Takamine et al.

Examiner

Barbara Summors

Group Art Unit

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— The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address —

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 (three) MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- ☐ Responsive to communication(s) filed on _____
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 1-22 is/are pending in the application.
- Of the above claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 1-3, 5, 8-12, 14, 18, 19, 21, 22 is/are rejected.
- ☒ Claim(s) 4, 6, 7, 13, 15-17 and 20 is/are objected to.
- ☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☒ The drawing(s) filed on 6/21/01 is/are objected to by the Examiner
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

- ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).
- ☒ All ☐ Some* ☐ None of the:
- ☒ Certified copies of the priority documents have been received.
- ☐ Certified copies of the priority documents have been received in Application No. _____
- ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____

Attachment(s)

- ☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____
- ☒ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Interview Summary, PTO-413
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Other _____

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DETAILED ACTION

Drawings

1. Figure 15 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated (see e.g. pg. 9, lns. 4-6 and pg. 22, lns. 8-9). See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
2. The drawings are objected to under 37 CFR § 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the filter “wherein in each of the first-stage and second-stage longitudinally coupled resonator type surface acoustic wave filters, the second IDT is split into two parts” as recited in claim 21, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered. Note that only one stage filter is shown with a split second IDT (see Fig. 16), and two such stages would not be consistent with claim 9 (see also the § 112 rejection below).

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

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Claim Objections

3. Claims 5 and 14 are objected to because of the following informalities:

In claim 5, on line 3, for clarity it appears that “fingers” should be followed by --of the first and third IDT--.

Similarly, in claim 14, on line 5, it appears that “fingers” should be followed by --of the first and third IDT--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 19 and 21 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 19 recites that “the polarity of the electrode fingers of the second IDT is (are?) the same as the polarities of the electrode fingers of the first and third IDTs adjacent to the second IDT” in the last four lines of the claim. This limitation is totally unclear as to which electrode fingers in the second IDT have the same polarity as which electrode fingers in the first and third IDTs. For example, are the nearest electrode fingers of the first and second IDTs and the nearest electrode fingers of the second and third IDTs intended to have the same polarity? Clarification is required.

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Claim 21 recites that “in each of the first-stage and second-stage longitudinally coupled... the second IDT is split into two parts” (emphasis added) in the last four lines of the claim. This limitation renders the claim totally unclear as to how the first stage second IDT can have an unbalanced signal terminal as previously recited in claim 9 (see lines 13-14) when splitting an IDT is only disclosed and shown as providing a balanced signal terminal (see e.g. Applicants’ Fig. 16).

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

7. Claims 1-3 and 8 are rejected under 35 U.S.C. § 102(e) as being anticipated by Hartmann et al. U.S. 6,268,782 B1.

Fig. 7 (a) of Hartmann et al. discloses a longitudinally coupled resonator type surface acoustic wave (SAW) filter having a balance-unbalance conversion comprising: a piezoelectric



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substrate of LiNbO_3 (see col. 8, lns. 61-64); and first, second and third interdigital transducers (IDTs) 702, 706 and 704, respectively (see col. 8, lns. 26-28), wherein the second center IDT 706 is a split IDT and hence, has an even number of electrode fingers. That is, each half 706a and 706b of IDT 706 has $2N+1$ electrodes where N is a positive integer, which is $4N+2$ total electrodes and must be an even number [see col. 5, lns. 30-35 with Figs. 3(a) and 3(b)]. Regarding claim 3, reflectors 708 are provided to the left and right of the IDTs in the SAW propagation direction. Regarding claim 8, the filter is disclosed as used in a communication apparatus (see e.g. col. 1, lns. 12-21).

8. Claims 9, 11, 12, 14, 18, 21, and 22 are rejected under 35 U.S.C. § 102(b) as being anticipated by Saw et al. U.S. 5,835,990.

Saw et al. discloses various unbalanced to balanced longitudinally coupled resonator type surface acoustic wave (SAW) filters in Figs. 5, 7, 9, 11, 13, and 15, and discloses balanced input and balanced output SAW filters in Figs. 17-20. Saw et al. further discloses cascade coupling these SAW filters together to provide higher order filters, wherein any of the filters disclosed are coupled depending on the need for balanced or unbalanced input and/or output terminals (see e.g. col. 10, lns. 40-50).

Regarding claims 9 and 14, by cascade coupling together the SAW filters of Fig. 7 and Fig. 17 as directed by Saw et al. (ibid.) a longitudinally coupled resonator type SAW filter is provided, comprising: a first-stage filter (Fig. 7) coupled to a second-stage filter (Fig. 17); an



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unbalanced signal terminal connected to the second IDT 36 at bus bar 48 (Fig. 7) of the first-stage filter; a first balanced signal terminal connected to one end (i.e. the left end in the figure) of the second IDT 36 at bus bar 48a (Fig. 17) of the second-stage filter; a second balanced signal terminal connected to the other end (i.e. the right end in the figure) of the second IDT 36 at bus bar 48b (Fig. 17) of the second-stage filter; a first signal line (i.e. the signal line from bus bar 50 in Fig. 7 and from bus bar 50 in Fig. 17) connecting one end of the first IDT 38 of the first-stage filter and one end of the first IDT 38 of the second-stage filter; a second signal line (i.e. the line from bus bar 56 in Fig. 7 and from bus bar 56 in Fig. 17) connecting one end of the third IDT 40 of the first-stage filter and one end of the third IDT 40 of the second-stage filter; wherein an electric signal propagating through the first signal line is 180 degrees out of phase with an electric signal propagating through the second signal line (see e.g. col. 6, ln. 63 through col. 7, ln. 13); and wherein in each of the first and second stage filters the electrode fingers of the first and third IDTs 38 and 40, that are adjacent to the second IDT 36, are opposite in polarity. For example, in each of Figs. 7 and 17 the electrode finger of the first IDT 38 which is closest to the second IDT, is connected to ground bus bar 52, while the electrode finger of the third IDT 40 which is closest to the second IDT is connected to signal bus bar 56. Fig. 11 connected to Fig. 19 also provides the recited filter structure

Regarding claims 11 and 12, Saw et al. discloses a piezoelectric substrate of LiNbO_3 (see e.g. col. 5, lns. 26-27), and reflectors 58 to the left and right of the first through third IDTs (38, 36, and 40, respectively from left to right) in each filter.

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Regarding claim 18, cascade connecting the filter of Fig. 13 as a first-stage filter to that of Fig. 20 as a second-stage filter via the 180 degree out of phase signal lines from bus bars 52 and 56 (see col. 8, lns. 63-67) provides a filter wherein in each stage the finger electrodes of the first and third IDTs 38 and 40 that are adjacent to the second IDT 36 are all ground electrodes. For example, in each of Figs. 13 and 20 the electrode finger of the third IDT 40 that is closest to the center second IDT 36, is connected to ground bus bar 54; and the electrode finger of the first IDT 38 that is adjacent to the center second IDT 36, is a short wide electrode finger connected to ground bus bar 50, as best shown in enlarged Fig. 14.

Regarding claim 21, as far as the claim can be understood, a second IDT 36 of the second stage is split (see Fig. 17 or Fig. 19 or Fig. 20 used as second-stage filters above). Regarding claim 22, see Fig. 4.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor

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and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 1-3, 5, 8, and 10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Saw et al. U.S. 5,835,990 in view of Hartmann et al. U.S. 6,268,782 B1.

Saw et al. discloses the invention as discussed above, except for explicitly disclosing the center IDT in at least one stage of the filter having an even number of electrode fingers.

Hartmann et al. discloses as explained above that it is well known in the art when splitting an interdigital transducer, that the two halves each have an odd number of fingers $2N+1$ producing a central split transducer having a total number of electrode fingers of $2N+1 + 2N+1$ or $4N+2$, which must be an even number [see col. 5, lns. 30-35 with Figs. 3(a) and 3(b) and the rejection above].

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the two stage filter of Saw et al. (e.g. Fig. 7 coupled to 17, Fig. 11 coupled to 19, or Fig. 13 coupled to 20), if even necessary, such that the split central IDT 36 of the second-stage filter would have had an even number of electrode fingers, because such an obvious modification would have been a well known manner of splitting IDTs as suggested by Hartmann et al. [see col. 5, lns. 30-35 with Figs. 3(a) and 3(b)], and because Saw et al. also suggests alternate equivalent means of providing the 180 degree phase difference for balanced

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signal connections (see e.g. the abstract, lns. 6-9) which one of ordinary skill would have known how to accomplish with even number of electrode fingers in the center IDT.

Allowable Subject Matter

11. Claims 4, 6, 7, 13, 15-17, and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record does not disclose or fairly suggest a longitudinally coupled resonator type SAW filter having each of the specifically recited combinations of features, and also especially: having the widths of the fingers on each side of the second IDT being wider than other remaining electrode fingers (see claims 4 and 13); or having a SAW resonator connected between the first and third IDTs and a terminal (see claims 6 and 15); or having first, second and third IDTs with narrow pitch electrode finger sections with a pitch narrower than other electrode finger sections (see claims 7 and 16); or having the first and second stages that either have the same structure (claim 17) or are symmetrical to each other (claim 20).

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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Nakazawa et al. JP 11-97966 discloses (Fig. 2) a balanced/unbalanced longitudinally coupled SAW filter with an even number of electrode fingers in a center split IDT 11a.

Nagatsuka et al. JP 2000-151337 discloses (Fig. 1) a balanced/unbalanced SAW longitudinally coupled filter with balanced terminals 7 provided by providing opposite polarity electrode fingers in IDTs 2 and 3 closest to the center IDT 1.

Ueda et al. U.S. 6,111,481 discloses (see col. 14, lns. 65-67) balanced/unbalanced longitudinally coupled SAW filters (see e.g. col. 15, lns. 5-8) wherein the IDTs all have a whole number of electrode finger pairs N and so must have an even number of electrode fingers (see e.g. col. 14, lns. 44-45 and col. 9, lns. 53-56).

Shimoe U.S. 5,874,868 discloses a longitudinally coupled SAW filter where the center IDT has an even number of electrode fingers (see Fig. 8B).

Dai et al. U.S. 5,790,000 discloses various connection schemes for balanced/unbalanced SAW filters (see especially Fig. 12, filters 2 and 3).

Edmonson U.S. 6,255,915 B1 and Kaawakatsu et al. U.S. 5,568,002 disclose other prior art longitudinally coupled resonator type SAW filters.

14. Any inquiry concerning this communication should be directed to Barbara Summons at telephone number (703) 308-4947, FAX no. (703) 308-7724, receptionist's no. (703) 308-0956.



Barbara Summons
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Art Unit 2817

bs
October 15, 2002